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MEMORANDUM

To: **Transportation Committee**

From: CMAP Staff

Date: November 11, 2016

Re: Transportation Asset Management: State of the Practice, Policy Options, and MPO Role

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This memo reviews the basics of Transportation Asset Management (TAM) and discusses the state of the practice of TAM, focusing on the applicability to municipalities. It is part of a series of memos contributing to an ON TO 2050 strategy paper that will identify potential future directions for TAM. A March 2016 memo to Transportation Committee reviewed the state of the practice nationally and in the region, as well as defining the key policy questions for the project. This memo reviews policy options for ON TO 2050, with final recommendations to be prepared in 2017 after inter-agency consultation. The work will be complete in early 2017.

As part of this process, staff is collecting data, seeking input of the Transportation Committee, and initiating a dialogue about the potential benefits and limitations of asset management as a strategy to maximize the benefits of transportation system expenditures.

Transportation Asset Management Background

TAM is a process to minimize the life-cycle asset costs necessary to attain performance goals (see the complete federal definition in the text box). It is a proven technique for cost efficiency, providing superior outcomes within constrained budgets. Pavement management programs in particular employ proven techniques to cost-effectively extend pavement life. Hence, this memo will concentrate on pavement management.

> *Asset management is a strategic and systematic process of operating, maintaining, and improving physical assets, with a focus on both engineering and economic analysis based upon quality information, to identify a structured sequence of maintenance, preservation, repair, rehabilitation, and replacement actions that will achieve and sustain a desired state of good repair over the lifecycle of the assets at minimum practicable cost. – 23 USC 101*

MAP-21 and the FAST Act required the implementation of asset management by transit agencies and IDOT (for the National Highway System). Because transit agencies and IDOT are subject to federal regulations on asset management, this memo will concentrate on local agencies' pavement assets. The federal regulations and the MPO role are summarized in a separate memo.

Local-agency highway assets are of interest because of the large scale of highway expenditures. In

addition to the federal-aid highway program we are all familiar with, an analysis of the US Census Bureau's Census of Governments 2013 survey indicated total highway outlays of over $1.5 billion for 99 of the largest communities, of which almost half were for capital outlays.[1]

According to CMAP analysis of 2016 municipal survey results, a minority of communities have instituted asset management programs. Resources are available from IDOT and other sources for those wishing to institute such a program.[2] This memo will lay out options for more focused programs and policies.

A basic asset management system, e.g., a pavement management system, typically consists of the following elements and capabilities:[3]

Elements of a Basic Asset Management System

1. Definition of system;
2. Software system to support asset management;
3. Asset inventory;
4. Asset condition assessment data, linked to the inventory;
5. Analytical processes and decision support tools, including a menu of asset treatments with expected costs and treatment outcomes;
6. Policy-based performance measures and targets by which to evaluate various investment scenarios;
7. A project-based prioritization of investments;
8. Management reports of results.

Capabilities of a Basic Asset Management System

1. Provides a definitive, central resource for an asset's inventory and condition;
2. GIS integration;
3. Analyzes different maintenance strategies;
4. Analyzes different budget scenarios;
5. Tracks and forecasts progress toward adopted maintenance targets;
6. Provides management information that justifies a particular budget request.

[1] This excludes federal-aid projects, which are generally let through IDOT. However, some communities, notably Chicago, locally let federal projects.

[2] See, for example, Illinois Center for Transportation, *Implementing Pavement Management Systems for Local Agencies: Implementation Guide.* August, 2011. Posted at http://www.idot.illinois.gov/assets/uploads/files/transportation-system/manuals-guides-&-handbooks/t2/p052.pdf. Accessed November, 2016.

[3] Ibid.

Basic asset management implementation among local agencies in the Chicago Region.

CMAP included several questions related to pavement management in its 2016 CMAP Municipal Plans, Programs, and Operations Survey.[4] Slightly fewer than half of agencies completing the survey confirmed they had a formal pavement management plan in place (See Figure 1)[5]. Only 40 percent of municipalities confirmed that they used a pavement condition measure – the choices given were pavement condition index, condition rating survey, or remaining service life -- that can reasonably be used as part of a pavement management system (Figure 2). Similarly, 39 percent of municipalities stated that they have established long-term performance targets for their primary pavement condition measure (Figure 3). Finally, Figure 4 shows that, even though the above figures show that many communities have a pavement management system in place, actual decisions are made through other processes ("worst first," advisory board recommendations) perhaps resulting in higher long-term costs.

Figures 1 through 4 demonstrate that many municipalities in northeastern Illinois have some level of asset management programs for pavement, and that some of the asset management programs are well developed. But most asset management programs we inquired about do not have basic features or functionality.

[4] Following are the asset management questions from CMAP's 2016 Municipal Survey:

24) Does your community use a formal pavement management system to prioritize local street maintenance and repair, either alone or as part of a multi-jurisdictional group? ☐ Yes, alone ☐ Yes, as part of a group ☐ No

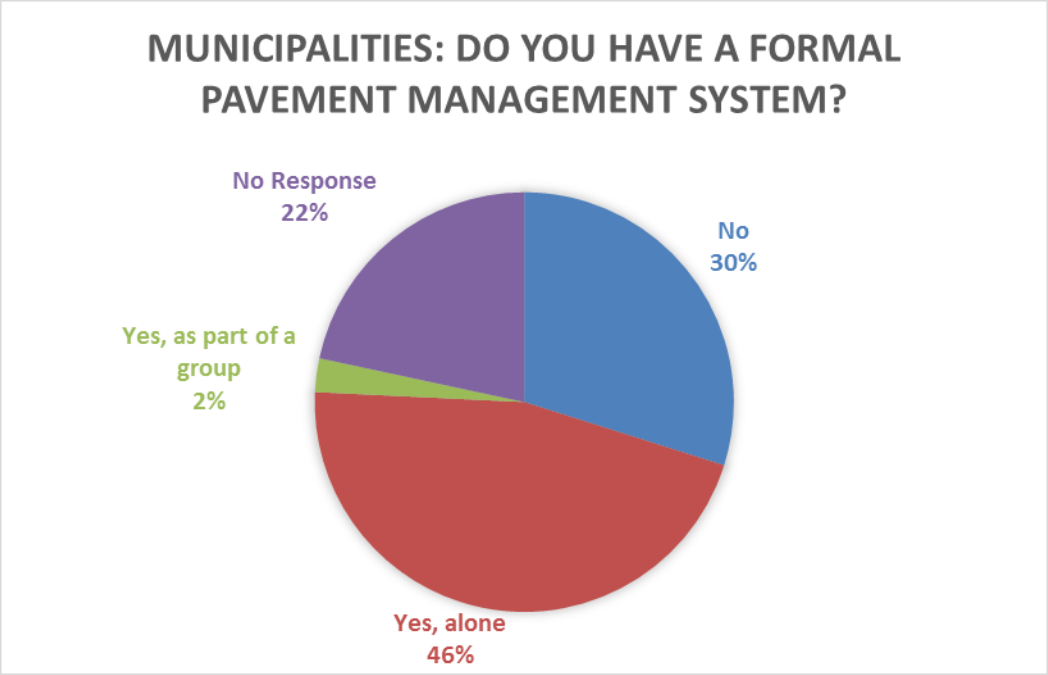
25) What is your *primary* pavement condition measure? ☐ Condition Rating Survey (CRS) ☐ International Roughness Index (IRI) ☐ Pavement Condition Index (PCI) ☐Remaining Service Life (RSL) ☐Other (e.g., visual inspection – please describe):

26) For your primary pavement condition measure, have you established long-term performance targets? ☐ Yes ☐ No ☐ Not applicable

27) What is your primary method of prioritizing resurfacing and reconstruction projects: ☐ Advisory board or elected official recommendations ☐ Address community complaints ☐ Fix the worst conditions first ☐ Minimize life cycle costs to meet performance targets ☐ Other (please describe)

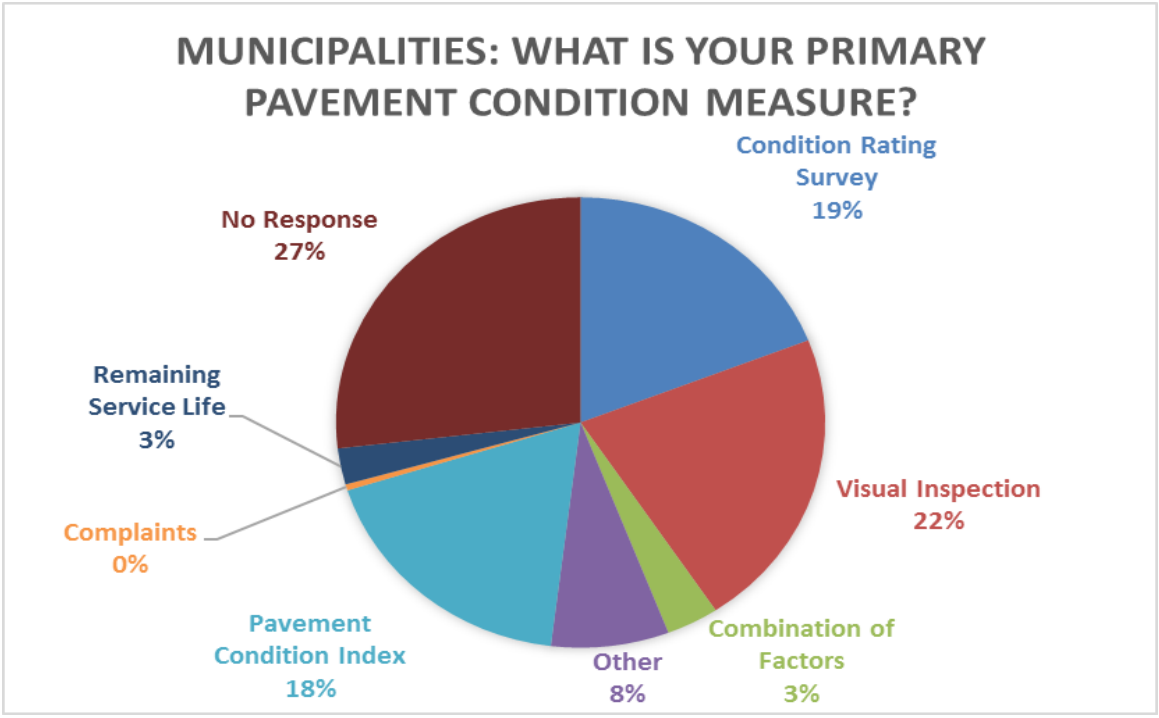
[5] One of the 2016 questions was also asked in the 2012 survey. While 64% of municipalities indicated they had a pavement management in 2012, the 2012 sample size (182) was smaller than in 2016 (231).

Figure 1: Pavement Management System



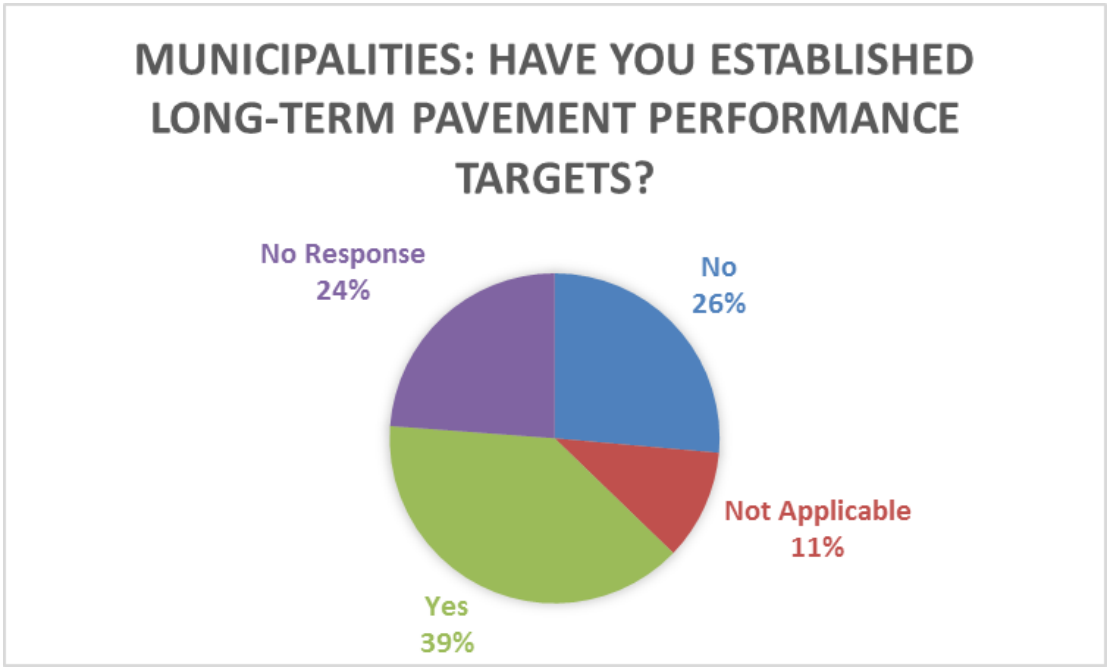
Source: 2016 CMAP Municipal Plans, Programs, and Operations Survey

Figure 2: Pavement Condition Measure



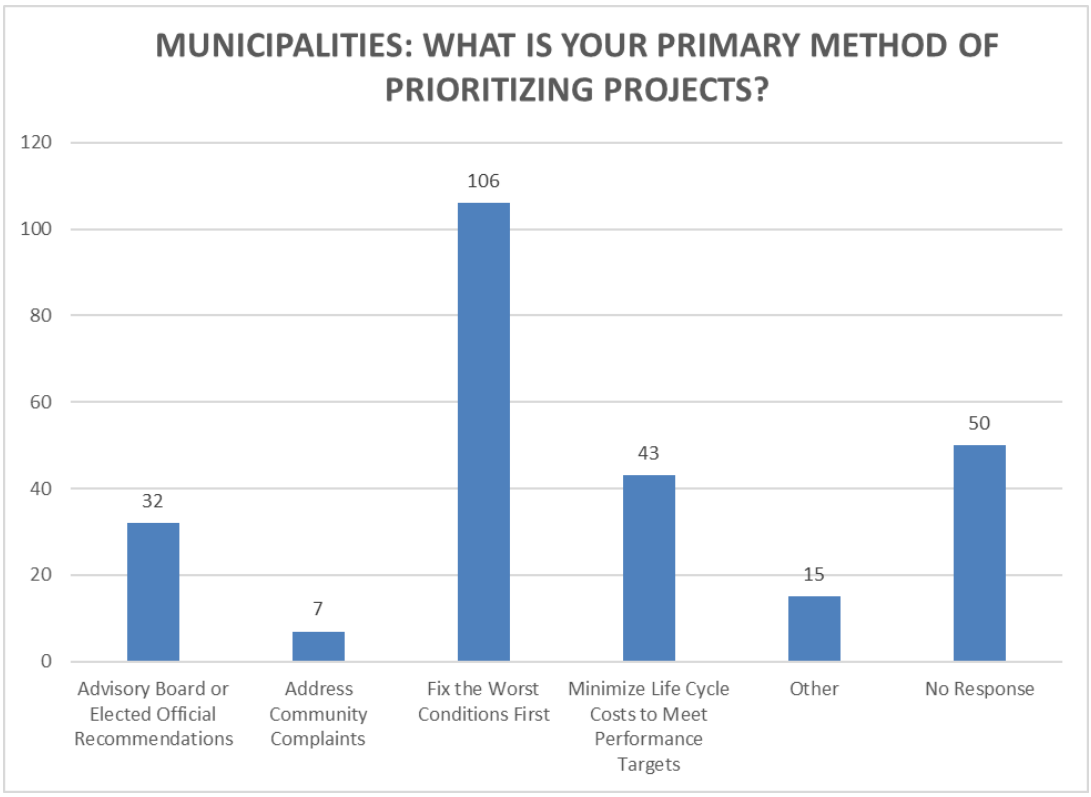
Source: 2016 CMAP Municipal Plans, Programs, and Operations Survey

Figure 3. Established Long-Term Performance Targets



Source: 2016 CMAP Municipal Plans, Programs, and Operations Survey

Figure 4. Primary Prioritization Method



Source: 2016 CMAP Municipal Plans, Programs, and Operations Survey

The precise impact of the lack of robust pavement management programs is unclear. Information about municipal pavement conditions and expenditures on pavement projects in the Chicago region is scarce. While we know that pavement condition has gotten better on the NHS routes in recent years, far less is known about condition off the NHS, and even if conditions are improving, it is not clear that the improvements are being pursued cost-effectively. Expenditure data provides little clarity; there is a great deal of variation in total highway outlays per centerline mile of municipal streets, as shown in the table below.

Variation in Municipal Outlays per Mile for Highways, Chicago Region, 2013

Percentile	10th	25th	50th	75th	90th
Municipal Outlays per Centerline Mile of Roadway Jurisdiction, 2013	$12,051	$21,003	$32,803	$45,456	$63,506

Source: CMAP Analysis of 2013 Census of Governments

There are many reasons for the variation in expenditures shown above. There may be inefficiencies in expenditures, or inadequate revenues for the need. In addition, some recently-developed communities with new infrastructure have lower costs than older communities. Lastly, communities undertaking large, locally-let capital projects have much higher outlays than otherwise comparable communities.

It is worth noting that an asset management system may not always point to decreased expenditures. After all, if pavements have not received adequate investment over time, an asset management program may demonstrate the need for additional funds to maintain satisfactory pavements, as was shown when Naperville implemented a pavement management program.[6] But while the goal is to minimize the lifecycle costs necessary to attain a performance goal, an asset management program in an environment of constrained budgets may be left to show the investments that are most effective given the constrained budget. Thus the actual budget impacts that can be expected depend on the context.

Basic asset management implementation in other metropolitan regions.

The **Metropolitan Transportation Commission (MTC),** the MPO for the nine-county San Francisco Bay Area, pioneered asset management in the 1980s to address local road and street maintenance needs and has a well-developed system addressing basic asset management needs for pavements. In 1981, MTC found that spending for local roadway maintenance had a deficit of $100 million per year, and that the region's streets and roads had a deferred maintenance cost of $300 to $500 million. In response, MTC began its pilot pavement management system in six communities in 1984, and implemented the program region-wide in 1986.[7] Given this history

[6] Illinois Center for Transportation. http://www.idot.illinois.gov/assets/uploads/files/transportation-system/manuals-guides-&-handbooks/t2/p052.pdf. Op. cit., p. 28.

[7] http://www.psrc.org/assets/11807/AssetManagementPeerReviewSummary2014May.pdf Page 4

and well-developed system, other MPOs look to MTC as a model for asset management implementation.[8]

MTC garnered initial stakeholder support for developing a regional asset management program through a common understanding of the need for additional pavement preservation resources. Advocacy, consensus, and feedback are maintained through MTC's Local Streets and Roads Working Group, which is comprised of regional public works directors and transportation managers.[9]

Moreover, the Pavement Management Technical Assistance Program (P-TAP) provides MTC's jurisdictions with assistance and expertise to implement and maintain a pavement management system, accurate pavement conditions, engineering design for pavement rehabilitation projects, and supports the region's management of non-pavement street and road assets. MTC has dedicated about $1.5 million of federal money annually for P-TAP grants as of August 2016.[10] The MTC-developed pavement management system, "StreetSaver," helps local cities and counties better maintain pavement within their jurisdiction. It was one of the first in the country to be tailored specifically for cities and counties, rather than for state highways. The system's scope includes all 100 municipalities in the Bay Area, nine counties, 42,800 lane miles of arterials, collectors, residential streets, and bridges. MTC prioritizes asset management in all aspects of their transportation planning process, and uses StreetSaver for data storage, long-range scenario planning, needs identification, and funding decisions.[11]

MTC has adopted a "Fix it First" approach to transportation planning, with the target of a pavement condition index score of 75, *satisfactory* out of 100 (the regional score as of August 2016 is 66, *fair*).[12] Over 87% of long-range regional transportation funding has been dedicated to maintaining the existing system. More broadly, MTC has effectively integrated pavement preservation into a variety of regional planning goals, with connections to focused growth and economic development.[13]

For short-range transportation programming, MTC relies on the StreetSaver system to select projects for regional discretionary funds. Though these funds are allocated to cities and counties using a performance-based formula, projects using regional funding must be recommended by

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[8] Much of this summary is developed from a Puget Sound Regional Council review conducted as PSRC was studying asset management implementation.

[9] http://www.psrc.org/assets/11807/AssetManagementPeerReviewSummary2014May.pdf Page 4

[10] http://mtc.ca.gov/our-work/invest-protect/investment-strategies-commitments/fix-it-first/local-streets-and-roads-0

[11] http://www.psrc.org/assets/11807/AssetManagementPeerReviewSummary2014May.pdf Page 4

[12] http://mtc.ca.gov/our-work/invest-protect/investment-strategies-commitments/fix-it-first/local-streets-and-roads

[13] http://www.psrc.org/assets/11807/AssetManagementPeerReviewSummary2014May.pdf Page 6

StreetSaver and be sponsored by an agency whose pavement management system has been certified by MTC.[14]

The **Northeast Ohio Areawide Coordinating Agency (NOACA)** is the MPO for the five-county Cleveland region. NOACA's asset management program is still in its early stages, having adopted its first Provisional Transportation Asset Management Policy in 2014.[15] That same year, NOACA began to implement the policy with a pavement analysis of federal-aid highways. The process is limited to federal-aid roads, but is managed by NOACA regionwide. However, NOACA staff reported that only "a handful" of communities implemented pavement management on their own, despite technical assistance and software available from the Ohio Department of Transportation.

NOACA has used the asset management system to present a dire picture of federal-aid pavement assets. The NOACA area has 1,500 lane-miles of freeways, almost 7,000 lane miles of other federal-aid roads, and more than 3000 bridges. 34 percent of pavements and 11 percent of bridges in the Cleveland region are not in a state of good repair. The cost to achieve a state of good repair is $3.2 billion.

However, while NOACA has completed the analysis, it has not identified funds necessary to achieve a state of good repair, or any new funds in general, to put the asset management system to work. Thus, the NOACA program is less advanced than the MTC program, and has substantially less upside potential because it does not harness local street improvements, but is limited to just the federal-aid system.

The **Michigan Department of Transportation** (MDOT) has placed an emphasis on regional strategies for asset management since 2002. Passed in 2002, Act 499 of the State of Michigan Public Acts encourages all agencies (primarily MPOs) using state transportation funds to implement an asset management system.[16] The act created the state's Transportation Asset Management Council (TAMC), and dedicated funding for asset management. TAMC. The TAMC, comprised of MDOT, county road commissions, MPOs, municipalities, and other appropriate stakeholders, provides leadership and oversight for the asset management system. TAMC sets the statewide transportation asset management strategy, goals for collecting condition data, and strategic goals for roads and bridges. Activities include surveying and reporting the condition of roads and bridges by functional classification categories, and assessing completed and planned investments in roads and bridges.[17] In addition, the TAMC submits an Annual Report describing the asset management-related efforts and condition of the road and bridge system from the prior year.[18]

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[14] http://www.psrc.org/assets/11807/AssetManagementPeerReviewSummary2014May.pdf Page 7
[15] http://www.noaca.org/modules/showdocument.aspx?documentid=5082.
[16] https://www.legislature.mi.gov/documents/2001-2002/publicact/pdf/2002-PA-0499.pdf
[17] http://tamc.mcgi.state.mi.us/TAMC/#/aboutus#overview
[18] http://www.michigan.gov/documents/mdot/AM_Facts_TAMC_Newsletter061114_459071_7.pdf

MDOT allocates $1 million annually for pavement preservation activities. This funding is distributed through the TAMC for the following purposes:

- Local agency reimbursement for pavement data collection costs on federal-aid and local routes
- Local and state asset management plan development
- Training and capacity building for local agencies
- Continuous enhancement and distribution of the Roadsoft software

For local agencies, the state maintains a grant program for collecting pavement condition data on local routes. Local access and/or residential routes are surveyed relatively infrequently and are not required to be reported.[19] MDOT requires that local agencies use Roadsoft GIS software to qualify for financial assistance for collecting pavement condition data on Federal Aid roads. Roadsoft was developed by Michigan Technological University, and is widely used throughout the state as a local pavement management system. It is available to all public agencies at no cost.[20]

Possible Ways to Encourage Transportation Asset Management for Local Agencies

Modern asset management for local communities could be promoted in several ways. Over the next few months, staff will consult stakeholders to identify an ON TO 2050 plan recommendation from among the options below (or other options identified by stakeholders):

Option 1: Provide Technical and Financial Assistance Directly to Municipalities. For this option, CMAP would adopt policies encouraging transportation asset management through ON TO 2050. To implement the policy, CMAP could provide financial assistance for developing or improving local transportation asset management through the UWP process, subject to other funding needs, potentially contracting through CMAP's Local Technical Assistance program. This takes advantage of existing processes and can reduce the up-front cost for participating communities, but the impact might be limited to a few communities as UWP and LTA resources would be limited.

Option 2: Selected Local Councils of Mayors or Counties to Pilot Subregional Pavement Management Implementation among Municipalities. This approach would implement an asset management system akin to MTC's, but at the Council or County level. The goal would be asset management deployment among all municipalities in the Council or County; policies on participation would probably be necessary to accomplish this. The roadways addressed in the pavement management system could be all streets or just those other than local (i.e., federal aid routes). Depending on the Council or County, municipalities could remain responsible for their individual pavement management systems, as in the Bay Area, or have a joint program.

[19] http://www.psrc.org/assets/11807/AssetManagementPeerReviewSummary2014May.pdf Page 11
[20] http://www.psrc.org/assets/11807/AssetManagementPeerReviewSummary2014May.pdf Page 12

Although not required, such a program could ideally include a non-federal financial package available to participating councils to address pavement deficiencies identified in the asset management program.

Option 3: Implement a Regional Program. This option would be to replicate the universal program in the fashion of the MTC or the more limited approach of NOACA, which is focused just on the federal-aid system. A regional program and standards would be developed, and projects proposed for funding come from an asset management plan. However, it is anticipated that substantially increased financial assistance or reallocation of existing funding would be necessary for both the implementation of the asset management plans and to finance the improvements called for in the plans. The advantage of this option is that it would be a bold initiative, with substantial benefits early in the program. The disadvantage is that there may be a substantial cost to fund necessary improvements.

For the above approaches, consultation will be initiated with Transportation Committee representatives, asset management staff previously identified by Transportation Committee representatives, Council of Mayors staff, and county transportation department staff. Based on these planning consultations and further consideration by CMAP staff, a recommendation will be presented to the Transportation Committee at a later date.

Next Steps

Following are the next steps:

1. Interagency consultation and development of recommendation for ON TO 2050 approach to municipal transportation asset management.
2. Exploration of special topics in asset management plans, such as the risk-based approach required by federal regulation; target setting; and the consideration of user costs in asset management plans.

Action Requested: Discussion

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